GOVERNMENT OF INDIA
SCIENCE AND TECHNOLOGY
LOK SABHA

STARRED QUESTION NO:357
ANSWERED ON:10.08.2016
Inventions/Discoveries in Science and Technology
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Will the Minister of SCIENCE AND TECHNOLOGY be pleased to state:

(a) the major inventions/discoveries made in the field of science and technology in the country during the last three years and the current year;

(b) the steps taken for the commercialisation of the said inventions/ discoveries; and

(c) the extent of success achieved as a result thereof?

Answer

MINISTER FOR MINISTRY OF SCIENCE AND TECHNOLOGY AND EARTH SCIENCES
(DR. HARSH VARDHAN)

(a) to (c): A statement is laid on the Table of the House.

STATEMENT AS REFERRED TO IN REPLY TO PARTS (a) TO (c) OF LOK SABHA STARRED QUESTION NO.357 FOR 10/08/2016 REGARDING INVENTIONS/DISCOVERIES IN SCIENCE AND TECHNOLOGY

(a) Several scientific organisations such as Department of Science & Technology (DST), Department of Biotechnology (DBT), Department of Scientific and Industrial Research (DSIR), National Research Development Corporation (NRDC), Indian Council of Agricultural Research (ICAR) have registered new inventions/ discoveries made in the field of Science & Technology in the country during the last three years and the current year.

Under Mega Science programme of DST, during 2015-16, a landmark discovery of gravitational waves was made in the field of physics and astronomy. Thirty seven Indian scientists also contributed in this discovery. The discovery of gravitational waves is a fundamental basic research discovery.

Out of the 75 promising leads from the research work carried out at ICMR Institutes/Centres in the last few years, 11 technologies have been released for commercialisation between 2013 to 2016. A total of 18 technologies have been licensed to industries for commercialization.

In one of the Nano Mission funded projects to promote scientific research in the frontier area of Nano Science and Technology, water purification systems for Arsenic & iron removal using nanotechnology (AMRIT- Arsenic and iron removal by Indian Technology) has been developed and commercialized at IIT-Madras. It functions without electricity which provides arsenic −free drinking water at a cost of less than 5 paise per litre.

Some of the major discoveries made by Indian researchers during last three years and current year include Smart nanoparticles based drug delivery systems, new technique to predict solar cycle. Indian scientists have contributed significantly in the discovery of Higgs Boson popularly known as Boson Particle.

The nature of cosmic sources, their radiation processes and environment are understood on the basis of emissions over the entire electromagnetic spectrum. Importantly, multi-wavelength studies can be made only from coordinated observations with different satellites. The most efficient and effective approach is to have a dedicated satellite with several co-aligned instruments covering the desired spectral bands (UV and X-ray). It will then be possible to simultaneously observe all the desired wavebands. The ASTROSAT Mission is one such endeavor. The Indian Institute of Astrophysics, Bengaluru designed and built the Ultra Violet Imaging Telescope (UVIT) payload and calibrated in partnership with the Canadian Space Agency; Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune; Tata Institute of Fundamental Research (TIFR); and Indian Space Research Organisation (ISRO). The pay load was successfully integrated and flown on board ASTROSAT satellite on Sept 28th 2015.

Sustainable industrial activities using local resources in the rural areas are extremely important for inclusive development of the country. The DST has prioritized interventions for the benefit of rural populations in particular. A Rural-Industry Complex has been established at Malunga village in Jodhpur district of Rajasthan in 2015- 16. Integration of technology in this industry complex has been done in such a manner that satisfies local needs by utilization of local resources, converts waste to wealth in environmentally friendly approaches to fulfill the objectives of Swachch Bharat, Swastha Bharat and Samarth Bharat initiatives.

In order to capture day light and concentrate the same inside the dark rooms, a low cost device named Surya Jyoti has been developed and tested with the support of a project from Department of Science & Technology over 2015-16. Surya Jyoti is basically a Micro Solar Dome which has a transparent semi-spherical upper dome made of acrylic material. This captures the sunlight that passes through a sun-tube of a thin layer of highly reflective coating on the inner wall of the passage. During the daytime, illumination of Surya Jyoti goes upto an equivalent of 15- watt LED lamp. The dome has also been integrated with Photo Voltaic (PV) panel to enable the dome to provide light upto 4 hours after sunset. The cost of Photo Voltaic integrated Surya Jyoti works out to Rs.1200 and without Photo Voltaic panel it works out to Rs.500. The cost is expected to come down drastically after scaling up of the manufacturing process.

Technologically feasible solutions for 19 site specific water challenges such as scarcity and water quality in 212 villages across 23 states with pathways for upscaling have been demonstrated. An indigenous technology on improving Traditional Water Mills for Income Generation to enhance the livelihood of Tribals in Arunachal Pradesh was demonstrated at two places Rikpu Ronya and Mukyom-Kojak village, West Siang District, Arunchal Pradesh.

Electronic Cordless Jacquard Loom Weaving Centre for Marginalized Handloom Weavers in Kanchipuram, Tamilnadu: The system is unique as this is an indigenous development to alleviate occupational stresses of the weaver and help develop design conversion tool using visual basic on windows operating platform. This will also help in the creation of new business opportunities for the handloom weavers.

A 2 units of 100 kw Micro Hydel Plants have been commissioned at height of 13000 feet in Thangu, North Sikkim based on Cross flow turbine technology.

DEVELOPMENT OF CROP VARIETIES Wheat: The Agharkar Research Institute, Pune had contributed to the development of ten wheat varieties, which include five durum, four aestivum and one dicoccum variety. The recently developed 10th variety - MACS 6478 was released and notified by the Central Subcommittee on Crop Standards on 30 July 2014 for timely sown irrigated conditions of the Peninsular Zone. Soybean variety MACS 1188 was released and notified by the Central Varietal Release & Notification Committee of the Indian Council of Agricultural Research, for cultivation in Southern Zone. Field trials at the farmers' fields in kharif season of 2014 gave maximum yield of 3250 kg/ha. The salient features of this variety include short maturity of 98 days; seed germination is above 90%; resistant to pod shattering and suitable for mechanical harvesting; and highly resistant to diseases like Rhizoctonia aerial blight, bacterial pustule and charcoal rot, major insect-pests like stem fly, pod borer, leaf folder, leaf miner and defoliators.

Microbial Enhanced Technology for Oil Recovery (MEOR): Agharkar Research Institute developed a microbial process for the recovery of crude oil from depleted wells having temperatures exceeding 91Â°C using a consortium of hyperthermophilic bacteria. Oil recovery to the tune of 60% was achieved by using this consortium during simulated sand pack experiments. This process was developed in collaboration with Institute of Reservoir Studies, Oil and Natural Gas Corporation Ltd (IRSONGC). The technology was implemented in field (ONGC owned oil well in South Kadi, Gujarat).

Department of Space has developed many technologies viz. Multilayer Printed Antenna Technology, DDV 100 Resin, Dual Polarisation LIDAR, Precision Tapping Mechanism, Photosynthesis Irradiance Incubator Box, CSNM 0102 adhesive, Hard anodising at room temperature, Polymide film including production of Polyamic Acid, Sesco-125 flame retardant coating, EPY 1061 coating compound, BMT ceramic, Benzoxazine Resin, EFA 4330 Film Adhesive, PC-10 Thermal Protection System, Silica Fiber, Silica Granule, Nickel Hydrazine Nitrate.

Under the Aided institutes supported by DST, Institute of Nano Science and Technology (INST), Mohali has developed a novel nanomaterial for the treatment of industrial and domestic effluents. This invention holds great potential for practical applications in recycling domestic as well as industrial wastewater to solve the problem of water scarcity in the country. Sree Chitra Tirunal Institute for Medical Science & Technology, (SCTIMST) Thiruvananthapuram has developed Harmone releasing intrauterine device "Emily" jointly with a industry partner. The clinical trials of the product have been successfully completed and product has been launched in the market. Raman Research Institute (RRI), Bangalore has invented an Impedance based 'Hand held milk purity testing device' to detect 'synthetic milk adulteration'. A new invention in antenna design was done at RRI to selectively reject bands corrupted by interference in wideband antennas. This enables using wideband antennas for sensitive measurements. International Advanced Research Centre for Powder Metallurgy and New Materials (ARCI), Hyderabad has developed photocatalytic TiO2 nanocrystalline particles for sunlight induced self-cleaning textile applications. ARCI has also developed silica aerogel based flexible mats for thermal insulation.

Some of the major inventions/discoveries in the filed of biotechnology are Fecal Incontinence Management device , Auditory Impairment Screening device, Soft Tissue Biopsy device, Ostomy Management Appliance, Limb Immobilization Device, Celiac Disease Diagnostic Kit, Rapid point-of-care typhoid diagnostic Kit, a genetically engineered ascorbic acid-deficient live mutant developed as vaccine candidate for visceral leishmaniosis, diagnostic kit for the onsite detection and identification of Banana Bunchy Top Virus (BBTV).

(b) The process of commercialisation of any invention/ discovery involves several steps in technology development chain.The Ministry has set up National Research Development Corporation (NRDC) for indigenously developed technology. NRDC provides value addition to the laboratory scale technologies assigned to it. The services provided by NRDC add value to the lab scale technologies and make them commercialisable which is an indispensable step towards growth of R&D and in turn leads to furtherance of R&D in the country. NRDC has filed about 1700 patents and signed 4874 licence agreements for transfer of technology in different sectors.

The new inventions/ technologies related to agriculture and allied sections generated in ICAR have been filed for protection as patent in the Indian Patent Office and for registration under Protection of Plant Varieties and Farmers' Rights Authority. Agrinnovate India Limited a registered Company has been established by Department of Agricultural Research and Education (DARE) which aims to work on the strengths of DAREs-ICAR and promote the development and spread of R&D outcomes through IPR protection and commercialisation.

The Ministry of Science & Technology has set up Patent Facilitating Cell for filing of patents and also established Technology Development Board of commercialization of indigenous technologies. START-UP NIDHI (National Initiative for Developing and Harnessing Innovations) supports startups/ innovative ideas right from proto-type development to commercialization through a bouquet of 7 programmes.

Women Technology Parks act as a single window hub for convergence of diverse technologies, integrated with forward and backward linkages leading to socio-economic development of women through capacity building and adoption of location-specific technologies, integrated with forward & backward linkages leading to development of women entrepreneurs. So far, 19 Women Technology Parks (WTPs) are fully functional benefitting about 20000 women while 13 WTPs have been established during past two years targeting another 25000 women.

In order to promote entrepreneurship and commercialization of research outcomes in the field of biotechnology, the Government has established "Biotechnology Industry Research Assistance Council" (BIRAC) under the aegis of the Department of Biotechnology (DBT) with the mandate to build the biotechnology innovation ecosystem in the country. Since its inception, BIRAC has provided funding to entrepreneurs, startups, SMEs and translational organizations to the tune of Rs 677 crores which has helped innovation research to bring high quality and affordable products towards commericialisation. The Biodesign programme implemented by the Department of Biotechnology aims to promote medical device innovation and to train the next generation of medical technology innovators by promoting entrepreneurship in medical device sector by creating Startups.

(c) NRDC has been successful in taking the lab scale technology to the commercial scale. The number of technologies commercialised during 2013-14 is 19, 2014-15 is 40, 2015-16 is 21 and 2016-17 upto 31.7.2016 is 7.

Some of the major technologies licensed to Industry are:

1 Super absorbent Hydrogel developed at Indian Agricultural Research Institute (IARI), New Delhi. It is a semi-synthetic super absorbent polymer for water saving and higher crop yield.
2 Extraction of Azadirachtin from Neem seeds developed at IARI, New Delhi- a neem based Bio-pesticide.
3 Potassium Humate from Lignite developed at Neyvelli Lignite Corporation, Neyveli. It is used as a fertilizer to obtain higher yields and better product quality.
4 Mosquito Larvicide formulation of Bacillus Thuringiensis (BT) -a bio-control agent.developed at Vector Control Research Centre (VCRC), Puducherry.
5 Vijetha Supplement Powder, developed at 'Central Sericultural Research & Training Institute (CSRTI), Mysore. A silkworm bed disinfectant.
6 Test Kit for Microbiological quality of Drinking water developed by Defence Research & Development Establishment (DRDE), Gawalior.
7 Various sericulture related technologies developed by Central Silk Board.
8 Para-Pheromone Trap, developed at Indian Institute of Horticultural Research (IIHR) for management of flies in fruit crops.
9 Micronutrient folior spray formulations for different crops, developed at IIHR & CSRTI.
10 Indelible Ink developed at CSIR-NPL (National Physical Laboratory). The ink is used for the election purpose.

Innovative technologies developed and commercialized under Water Technology Initiative (WTI) of DST include technology developed for Dielectric Barrier Discharge (DBD) based plasma system for disinfection. The technology has been successfully transferred for commercialization. A water purifier for arsenic and iron free drinking water, based on iron oxyhydroxide, a nanostructured material to remove arsenic has been developed at IIT Madras, the technology has been transferred to a start up. TiO2 (Titanium dioxide) self-cleaning technology developed at ARCI, Hyderabad is commercialized and the textile garments are launched in the market.

Efforts have been made at Department of Space to commercialise the in-house development of technologies. During the said period, 20 technologies have been transferred to industries. NIF supported grassroots innovators to start/ scale up their enterprises. During the said period, technology of 20 grassroots innovations and traditional knowledge based products have been transferred through various licenses.

The ICMR has filed the Indian and international patents on new inventions for facilitating the commercialization process. Six ELISA based technologies for diagnosis of viral disease (viz. Hepatitis E, Japanese encephalitis, Crimean congo hemorrhagic fever, Chandipura virus and Kyasanur forest disease) have been transferred to industry.

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